TOPEX / POSEIDON PROJECT

SATELLITE / SENSORS PERFORMANCE CHARACTERISTICS WORKSHOP #9

Abe Soroosh

Maneuver Performance and Orbit Maintenance Status

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GROUND TRACK MAINTENANCE REQUIREMENTS

- 95 % of all equatorial crossings are contained within a 2-km longitude band at each orbit node
- 95 % of all verification site overflights are within 1-km about the site during initial verification phase. This requirement is currently being kept
- Mean value of Eccentricity is contained within 0.001
- Maneuver spacing be consistent with POD requirements
- Maintenance maneuvers over land

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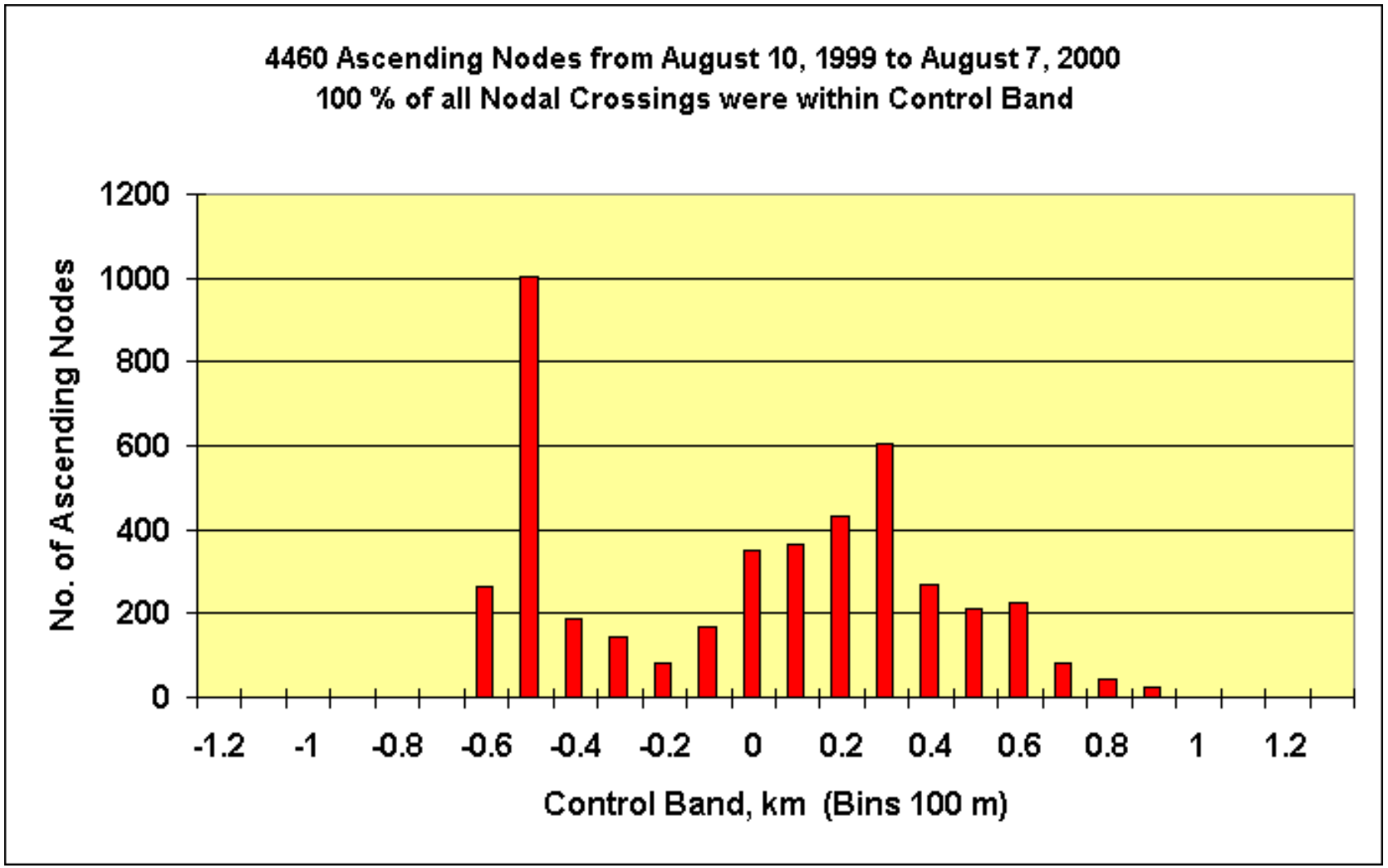
GROUND TRACK MAINTENANCE STATISTICS



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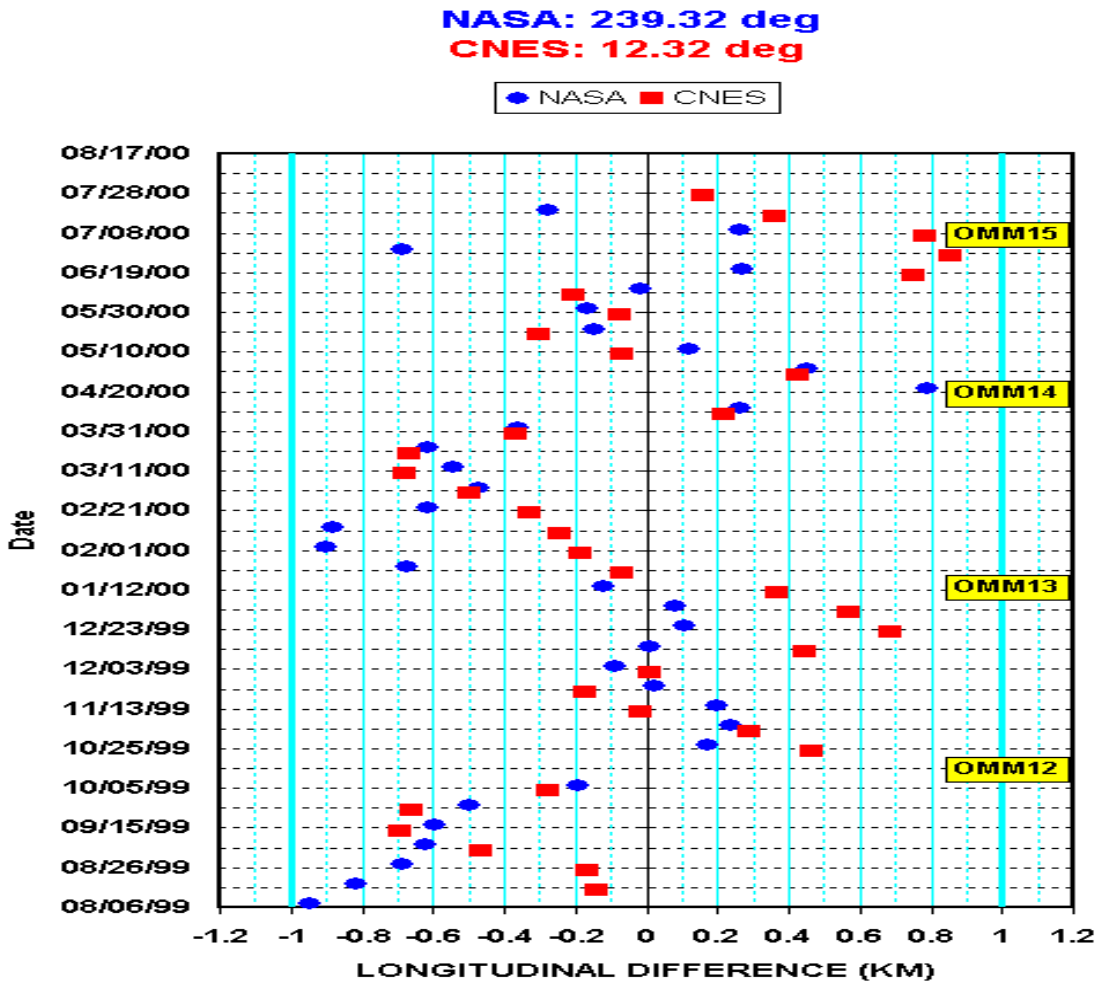
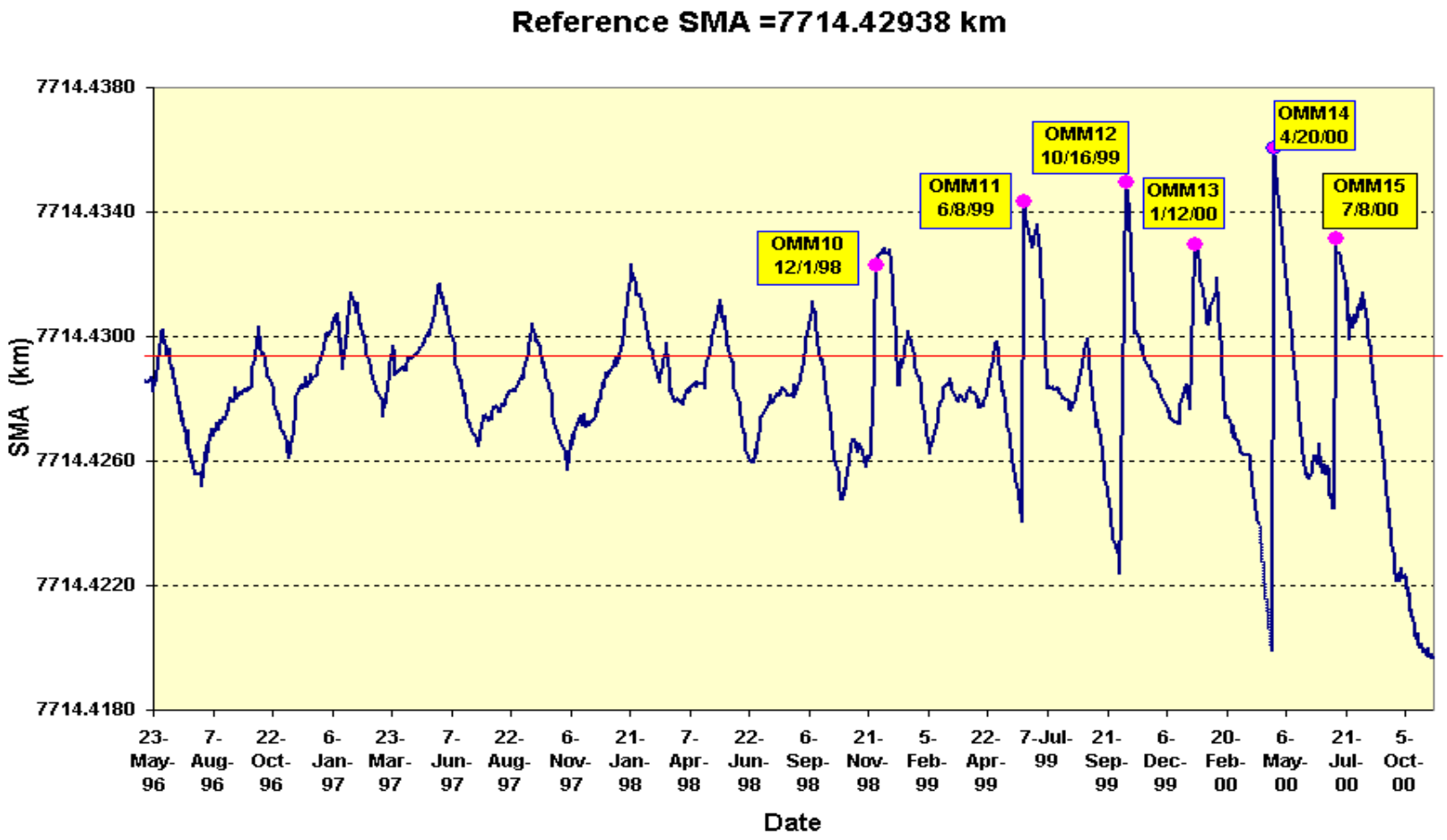
VERIFICATION SITE OVERFLIGHTS MAINTENANCE

- Continued to maintain verification site overflights within the control band for both NASA and CNES
- No violation of site overflights since last workshop
- No violation of site overflights since Feb. 1997

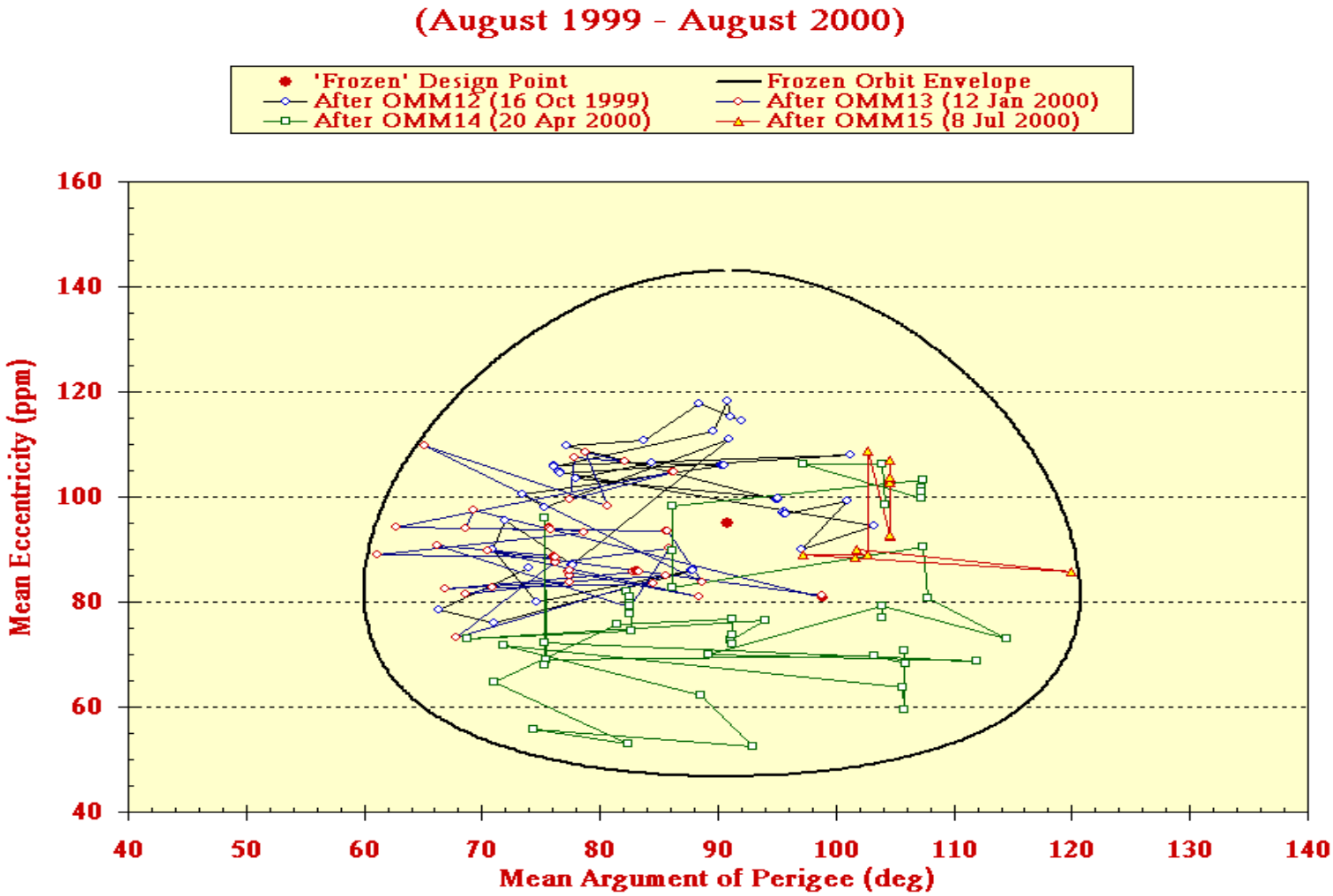
TOPEX/POSEIDON VERIFICATION SITES



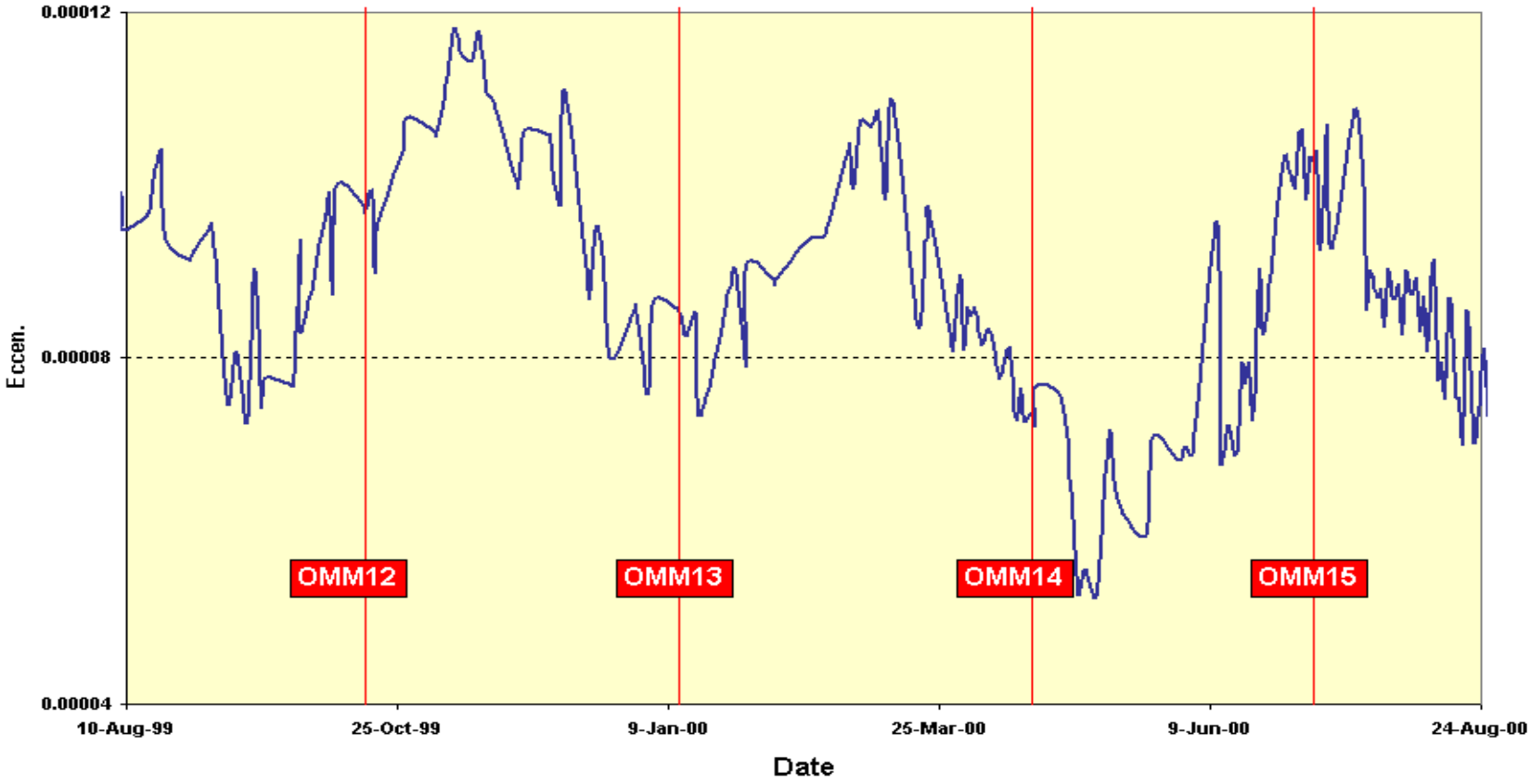
MEAN SEMI_MAJOR AXIS HISTORY



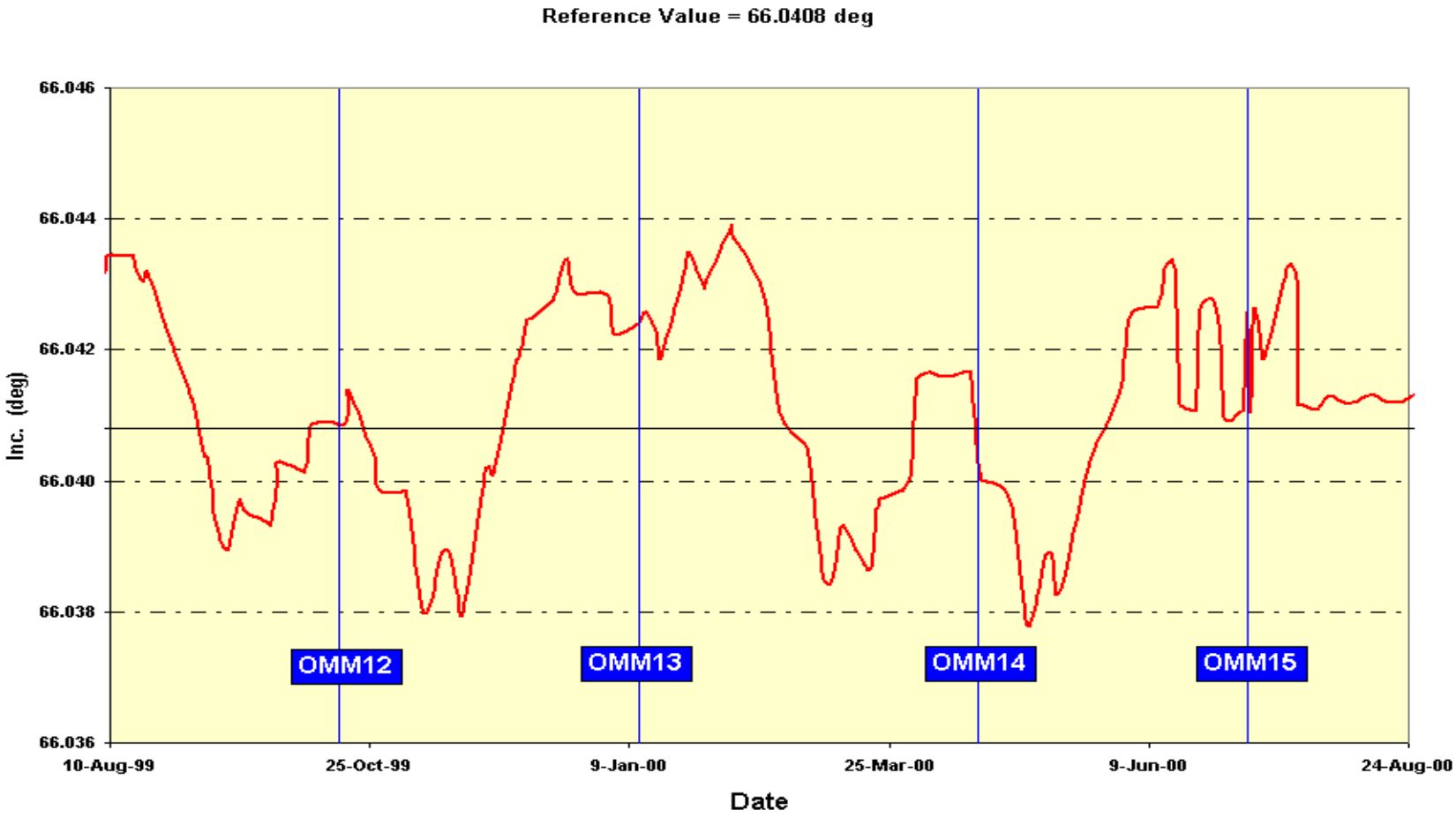
Mean Eccentricity Vector



Mean Orbit Eccentricity Variations vs. Time



Mean Inclination History



LEAD /LAG STRATEGY

- **Full and partial lead / lag strategies during fixed yaw periods continued to be used to maintain ground track within control boundaries, and to maximize maneuver spacing**
- **Fixed yaw periods:**

  $-30^o < ß' < 0^o$ (flying backward, yaw=180º)

  $0^o < ß < 30^o$ (flying forward, yaw=0º)

- **Continued dual solar array pitch bias (SAB) strategy to accommodate battery management concerns.**

  SAB = +40º (SA in lead position)

  SAB = -40º (SA in lag position)

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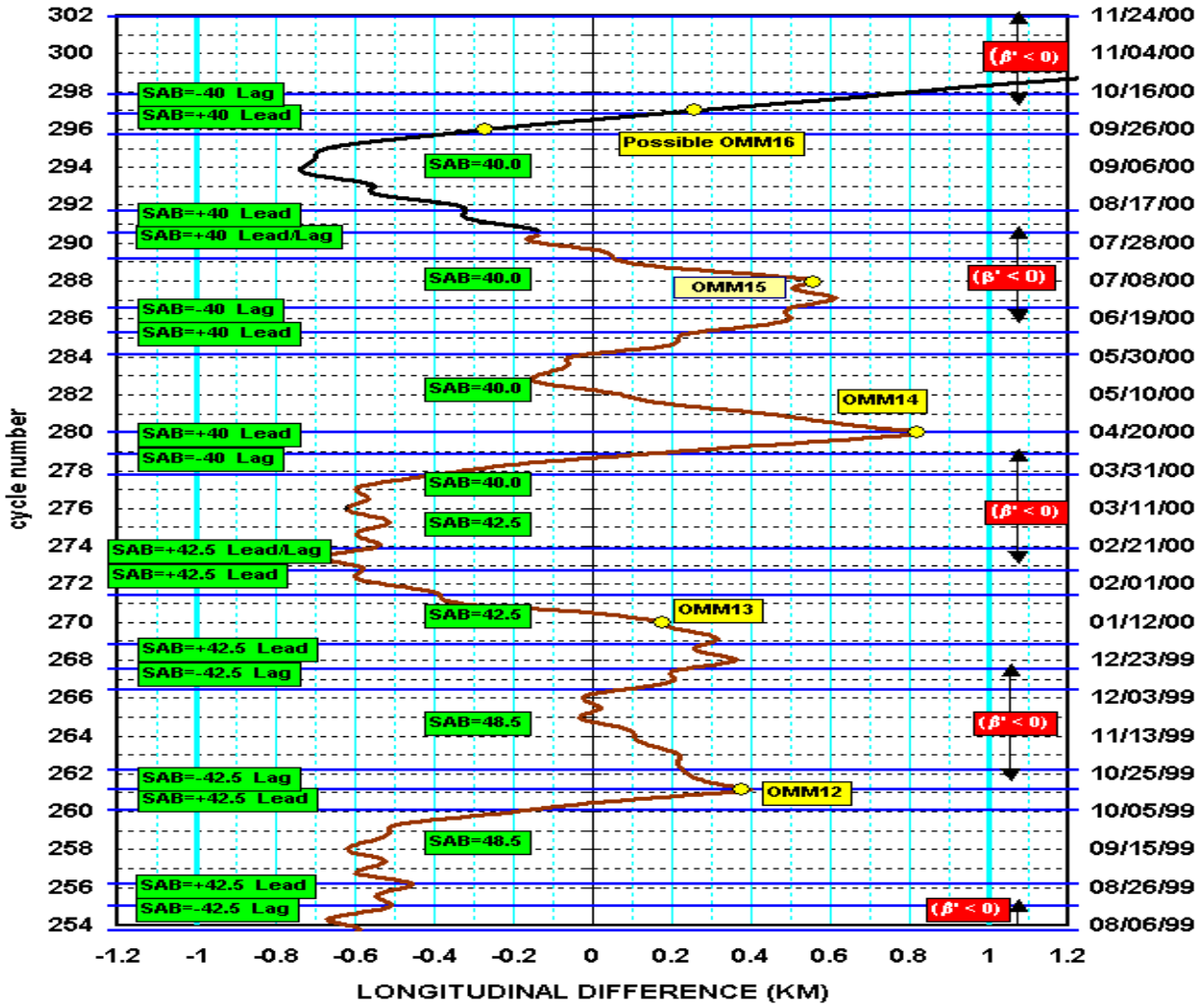
LEAD /LAG STRATEGY

- Creating boost strategy : (SAB lead + yaw=0º)

  (SAB lag + yaw=180º)
- Creating decay strategy : (SAB lead + yaw=180º)

  (SAB lag + yaw=0º)
- Solar activity has increased considerably since last year. Drag forces becoming dominant forces reducing influence of lead / lag strategies.
- Four maneuvers since last workshop. Average maneuver spacing of 3 months accomplished using lead/lag strategy.
- Plan to standardize maneuvers, (OMMs during fixed yaw flying forward periods) to reduce / simplify design, constraint checking and to eliminate large yaw turns.
- OMM15 was performed on July 8, 2000 and next maneuver is expected late September 2000.

TOPEX/POSEIDON GROUND TRACK VARIATIONS AT ASCENDING EQUATOR CROSSINGS



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Summary of Orbit Maintenance Maneuvers

OMM	DATE	CENTROID TIME (UTC)	ORBIT No.	CYCLE BOUND.	MAN SPACING (DAYS)	Ach. Delta-v (mm/s)
OMM1	10/12/92	23:13:00	807	2/3		9.43
OMM2	12/21/92	09:03:00	1696	9/10	70	3.15
OMM3	3/30/93	12:44:00	2966	19/20	99	4.62
OMM4	8/6/93	10:01:00	4617	32/33	129	4.61
OMM5	1/31/94	20:50:30	6902	50/51	178	4.12
OMM6	5/20/94	23:52:00	8300	61/62	109	3.12
OMM7	10/6/94	18:13:00	10077	75/76	139	3.14
OMM8	5/22/95	22:03:00	13000	98/99	226	3.83
OMM9	1/15/96	19:10:42	16046	122/123	238	3.65
OMM10	12/1/98	20:36:40	29508	228/229	1051	2.88
OMM11	6/8/99	07:11:00	31922	247/248	189	5.02
OMM12	10/16/99	19:18:00	33594	260/261	130	5.88
OMM13	1/12/00	10:39:00	34716	269/270	88	3.05
OMM14	4/20/00	15:56:00	35987	279/280	99	6.60
OMM15	7/8/00	23:09:00	37003	287/288	79	3.39

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Maneuver Performance

Maneuver	Date	Ideal del-v (mm/s)	Ach. del-v NAVT	Ach. Del-v FDF	Difference Ach-Ideal (%)
OMM1	OCT 12, 92	9.100	9.431	9.425	+3.64
OMM2	DEC 21, 92	3.200	3.153	3.151	-1.47
OMM3	MAR 30, 93	4.676	4.617	4.610	-1.26
OMM4	AUG 6, 93	4.620	4.611	4.611	-0.20
OMM5	JAN 31, 94	4.000	4.116	4.102	+2.90
OMM6	MAY 20, 94	3.150	3.123	3.123	-0.78
OMM7	OCT 6, 94	3.150	3.146	3.162	-0.21
OMM8	MAY 22, 95	3.860	3.832	3.832	-0.78
OMM9	JAN 15, 96	2.500	3.652	N.A.	+46.00
OMM10	DEC 1, 98	3.100	2.877	2.935	-7.19
OMM11	JUN 8, 99	5.200	5.021	5.014	-3.50
OMM12	OCT 16, 99	5.700	5.878	6.063	+3.12
OMM13	JAN 12, 00	3.200	3.054	3.036	-4.56
OMM14	APR 20, 00	6.800	6.600	6.740	-2.90
OMM15	JUL 8, 00	3.400	3.389	3.506	-0.32

Conclusion

- Ground track and orbit maintenance status well within mission requirements. Verification site overflights requirements continued to be met.
- OMM12, OMM13, OMM14, OMM15 implemented successfully since workshop#8.
- Anomalous force continues to be uncertain force. However its influence becoming less than drag uncertainties.
- Lead/lag strategies continue to be used to maintain ground track within requirement boundary.
- Plan to perform future maneuvers during fixed yaw flying forward periods, if possible.